

SEP 13 2005

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From: Todd M. Becker
Date: September 13, 2005 Time: _____
Operator: Adrian Villarreal Matter: 42P16449
Number of pages including cover sheet: 18 pages
In Re Patent Application of: Lu et al.
Application No.: 10/606,092
Filed: June 24, 2003
For: UNDERFILL INTEGRATION FOR OPTICAL PACKAGES

Enclosed are the following documents: _____
Transmittal Letter – in duplicate (4 pages)
Amendment AF (13 pages)

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05/01/03

Attorney's Docket No.: 42P16449PatentIn re the Application of: Lu et al.

(inventor(s))

AMENDMENT UNDER
37 C.F.R. § 1.116
EXPEDITED PROCEDUREApplication No.: 10/606,092EXAMINING GROUP 2800Filed: June 24, 2003For: UNDERFILL INTEGRATION FOR OPTICAL PACKAGES

(title)

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P.O. Box 1450
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SIR: Transmitted herewith is an Amendment After Final Action for the above-referenced application.

XX Applicant claims small entity status. See 37 CFR 1.27.XX No additional fee is required.XX A Notice of Appeal is enclosed.

The fee has been calculated as shown below:

	(Col. 1)		(Col. 2)	(Col. 3)	SMALL ENTITY		OTHER THAN A SMALL ENTITY	
	Claims Remaining After Amd.		Highest No. Previously Paid For	Present Extra	Rate	Additional Fee	Rate	Additional Fee
Total Claims	• 26	Minus	** 46	0	X25	\$	X50	\$ 0
Indep. Claims	• 3	Minus	*** 5	0	X100	\$	X200	\$ 0
	First Presentation of Multiple Dependent Claim(s)				+180	\$	+360	\$
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BLAKELY SOKOLOFF TAYLOR & ZAFMAN LLP

Date:

9-13-05

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Attorney's Docket No.: 42P16449 Patent
 In re the Application of: Lu et al. **AMENDMENT UNDER**
37 C.F.R. § 1.116
EXPEDITED PROCEDURE
 Application No.: 10/606,092 **EXAMINING GROUP** 2800
 Filed: June 24, 2003
 For: UNDERFILL INTEGRATION FOR OPTICAL PACKAGES
(Title)

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Total Claims	26	Minus	46	**	0	X25	\$	X50	\$ 0
Indep. Claims	3	Minus	5	***	0	X100	\$	X200	\$ 0
First Presentation of Multiple Dependent Claim(s)						+180	\$	+360	\$
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extra claims.
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Date: 9-13-05

Todd M. Becker
Todd M. Becker
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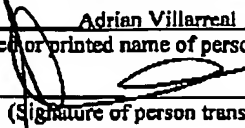
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(Signature of person transmitting paper)**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**Applicants: *Lu et al.*

Serial No.: 10/606,092

Filed: June 24, 2003

For: UNDERFILL INTEGRATION
FOR OPTICAL PACKAGES

Docket No.: 42P16449

Examiner: William D. Coleman

Art Unit: 2823

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Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450**AMENDMENT B AFTER FINAL REJECTION (37 C.F.R. § 1.116)**

Sir:

This amendment is submitted in response to the final Office Action mailed July 13, 2005,
for the above-noted patent application.

Applicants respectfully request that the Examiner do the following with this amendment:

1. Please enter the amendments to the specification, if any, in section I.
2. Please enter the amendments to the claims, if any, in section II.
3. Please consider the specification amendments in section I and the claims in section II in view of the remarks in section III.

SECTION I—SPECIFICATION AMENDMENTS

Please amend the specification as shown below:

[No Specification Amendments]

SECTION II—CLAIMS

1. (Currently Amended) An apparatus comprising:

an optical die flip-chip bonded to a substrate and defining a volume between the optical die and the substrate, the optical die including an optically active area on a surface of the die facing the substrate;

an optically transparent underfill material occupying at least those portions of the volume substantially corresponding with the optical path of the optically active area; and

an opaque underfill material occupying portions of the volume not occupied by the optically transparent underfill material.
2. (Original) The apparatus of claim 1 wherein the optically active area is a detector or a source.
3. (Original) The apparatus of claim 1 wherein the optically transparent material has a low modulus of elasticity.
4. (Original) The apparatus of claim 1 wherein the optically transparent material is optically transparent at wavelengths between 800 nm and 1550 nm.
5. (Original) The apparatus of claim 4 wherein the optically transparent material is optically transparent at a wavelength of approximately 850 nm.
6. (Original) The apparatus of claim 1 wherein the optically transparent material has a refractive index of approximately 1.5.
7. (Original) The apparatus of claim 1 wherein the optically transparent material is an adhesive.

8. (Original) The apparatus of claim 7 wherein the optically transparent material is silicone-based.
9. (Currently Amended) An apparatus comprising:
- an optical die flip-chip bonded to a substrate and defining a volume between the optical die and the substrate, the optical die including an optically active area on a surface of the die facing the substrate;
 - an optical component partially positioned in the volume between the optical die and the substrate to carry an optical signal to or receive an optical signal from the optically active area;
 - an optically transparent underfill material occupying those portions of the volume substantially in the optical path of the optically active area; and
 - an opaque underfill material occupying portions of the volume not occupied by the optically transparent underfill material and the optical component.
10. (Original) The apparatus of claim 9 wherein the optical component is a waveguide.
11. (Original) The apparatus of claim 9 wherein the optically active area is a detector or a source.
12. (Original) The apparatus of claim 9 wherein the optically transparent material has a refractive index substantially the same as a refractive index of the optical component.
13. (Original) The apparatus of claim 9 wherein the optically transparent material has a refractive index of approximately 1.5.

14. (Original) The apparatus of claim 9 wherein the optically transparent material has a low modulus of elasticity.
15. (Original) The apparatus of claim 9 wherein the optically transparent material is optically transparent at wavelengths between 800 nm and 1550 nm.
16. (Original) The apparatus of claim 15 wherein the optically transparent material is optically transparent at a wavelength of approximately 850 nm.
17. (Original) The apparatus of claim 9 wherein the optically transparent material is an adhesive.
18. (Original) The apparatus of claim 9 wherein the optically transparent material is silicone-based.
19. (Currently Amended) A system comprising:
 - a signal source;
 - a first optical die coupled to the signal source, the first optical die being flip-chip bonded to a substrate and defining a first volume between the first optical die and the substrate, the first optical die including an optically active area on a surface of the die facing the substrate;
 - a signal destination;
 - a second optical die coupled to the signal destination, the second optical die being flip-chip bonded to a substrate and defining a second volume between the second optical die and the substrate, the second optical die including an optically active area on a surface of the die facing the substrate;

an optical component extending between the first and second optical dies,
the optical component partially positioned in the first and second volumes;

an optically transparent underfill material occupying those portions of the
first and second volumes substantially in the optical paths of the optically active
areas; and

an opaque underfill material positioned in the first and second volumes, the
opaque underfill material occupying portions of the volumes not occupied by the
optically transparent underfill material.

20. (Original) The system of claim 19 wherein the optical component is a waveguide.
21. (Original) The system of claim 19 wherein the optically active area of the first die
is a source and the optically active area of the second die is a detector.
22. (Original) The system of claim 19 wherein the optically transparent material has a
refractive index substantially the same as a refractive index of the optical
component.
23. (Original) The system of claim 19 wherein the optically transparent material has a
refractive index of approximately 1.5.
24. (Original) The system of claim 19 wherein the optically transparent material has a
low modulus of elasticity.
25. (Original) The system of claim 19 wherein the optically transparent material is
optically transparent at wavelengths between 800 nm and 1550 nm.
26. (Original) The system of claim 25 wherein the optically transparent material is
optically transparent at a wavelength of approximately 850 nm.

27.-46. (Canceled)

SECTION III—REMARKS

This amendment is submitted in response to the final Office Action mailed July 13, 2005. Claims 1, 9 and 19 are amended herein, and claims 1-26 remain pending in the application. Applicants respectfully request reconsideration of the application and allowance of all pending claims in view of the above amendments and the following remarks.

Rejections Under 35 U.S.C. § 102

The Examiner rejected claims 1-5, 9-12, 14-16, 19-22, and 24-26 as anticipated under 35 U.S.C. § 102(e) by U.S. Patent Application Publication No. 2004/018599 to Chason *et al.* ("Chason"). Applicants respectfully traverse the Examiner's rejections. A claim is anticipated only if each and every element, as set forth in the claim, is found in a single prior-art reference. MPEP § 2131; *Verdegaal Bros. v. Union Oil of California*, 2 U.S.P.Q.2d 1051, 1053 (Fed. Cir. 1987). As explained below, Chason cannot anticipate these claims because it does not disclose every element and limitation recited therein.

Claim 1, as amended, recites an apparatus combination including an optical die flip-chip bonded to a substrate and defining a volume between the optical die and the substrate, the optical die including an optically active area on a surface of the die facing the substrate, "an optically transparent underfill material occupying at least those portions of the volume substantially corresponding with the optical path of the optically active area," and an opaque underfill material occupying portions of the volume not occupied by the optically transparent underfill material. Chason, in Figure 2, discloses that the volume between the substrate 230 and the flip chip 210 is filled with an underfill material 240, except in the region between optical devices 234 and 264. The region between the optical

devices 234 and 264 contains only air. The Examiner argues that the air between devices 234 and 264 is an optically transparent underfill material, and that Chason therefore anticipates the claim.

Applicants respectfully disagree. Air cannot be considered an underfill material. Chason makes clear that the purpose of its apparatus is to keep the optical path between optical devices free from any underfill material. See paragraph [0007]. This is accomplished by inserting underfill material only in the non-optical portions of the flip chip 210. See paragraph [0028]. Chason is thus defined by the *absence* of any underfill material whatsoever between the optical devices 234 and 264, rather than by the presence of an optically transparent underfill. As a result, Chason cannot disclose, teach or suggest a combination including "an optically transparent underfill material occupying at least those portions of the volume substantially corresponding with the optical path of the optically active area" and "an opaque underfill material occupying portions of the volume not occupied by the optically transparent material." Applicants submit that Chason therefore cannot anticipate this claim, and respectfully request withdrawal of the rejection and allowance of the claim.

Regarding claims 2-5, if an independent claim is allowable, then any claim depending therefrom is also allowable. See generally MPEP § 2143.03; *In re Fine*, 837 F.2d 1071 (Fed. Cir. 1988). As discussed above, claim 1, as amended, is in condition for allowance. Applicants respectfully submit that claims 2-5 are therefore allowable by virtue of their dependence on an allowable independent claim, as well as by virtue of the features recited therein. Applicants therefore respectfully request withdrawal of the rejections and allowance of these claims.

Claim 9, as amended, recites an apparatus combination including an optical die flip-chip bonded to a substrate and defining a volume between the optical die and the substrate, the optical die including an optically active area on a surface of the die facing the substrate; an optical component partially positioned in the volume between the optical die and the substrate to carry an optical signal to or receive an optical signal from the optically active area; "an optically transparent underfill material occupying those portions of the volume substantially in the optical path of the optically active area"; and an opaque underfill material occupying portions of the volume not occupied by the optically transparent underfill material and the optical component. By analogy to the discussion above for claim 1, Applicants submit that Chason does not disclose, teach or suggest a combination including "an optically transparent underfill material occupying those portions of the volume substantially in the optical path of the optically active area" and "an opaque underfill material occupying portions of the volume not occupied by the optically transparent underfill material and the optical component." Applicants submit that Chason therefore cannot anticipate this claim, and respectfully request withdrawal of the rejection and allowance of the claim.

Regarding claims 10-12 and 14-16, if an independent claim is allowable, then any claim depending therefrom is also allowable. *See generally* MPEP § 2143.03; *In re Fine*, 837 F.2d 1071 (Fed. Cir. 1988). As discussed above, claim 9, as amended, is in condition for allowance. Applicants respectfully submit that claims 10-12 and 14-16 are therefore allowable by virtue of their dependence on an allowable independent claim, as well as by virtue of the features recited therein. Applicants therefore respectfully request withdrawal of the rejections and allowance of these claims.

Claim 19, as amended, recites a system combination including first and second optical dies, each optical die being flip-chip bonded to a substrate and defining a volume between the optical die and the substrate, and each optical die including an optically active area on a surface of the die facing the substrate, an optical component extending between the first and second optical dies, the optical component partially positioned in the first and second volumes, "an optically transparent underfill material occupying those portions of the first and second volumes substantially in the optical paths of the optically active areas," and an opaque underfill material positioned in the first and second volumes, the opaque underfill material occupying portions of the volumes not occupied by the optically transparent underfill material. By analogy to the discussion above for claim 1, Applicants submit that Chason does not disclose, teach or suggest a combination including "an optically transparent underfill material occupying those portions of the first and second volumes substantially in the optical paths of the optically active areas" and "an opaque underfill material positioned in the first and second volumes, the opaque underfill material occupying portions of the volumes not occupied by the optically transparent underfill material." Applicants submit that Chason therefore cannot anticipate this claim, and respectfully request withdrawal of the rejection and allowance of the claim.

Regarding claims 20-22 and 24-26, if an independent claim is allowable, then any claim depending therefrom is also allowable. *See generally* MPEP § 2143.03; *In re Fine*, 837 F.2d 1071 (Fed. Cir. 1988). As discussed above, claim 19, as amended, is in condition for allowance. Applicants respectfully submit that claims 20-22 and 24-26 are therefore allowable by virtue of their dependence on an allowable independent claim, as well as by

virtue of the features recited therein. Applicants therefore respectfully request withdrawal of the rejections and allowance of these claims.

Rejections Under 35 U.S.C. § 103

The Examiner rejected claims 6, 13 and 23 under 35 U.S.C § 103(a) as obvious in view of, and therefore unpatentable over, Chason. Applicants respectfully traverse the Examiner's rejection. If an independent claim is non-obvious under 35 U.S.C. § 103, then any claim depending therefrom is also non-obvious. MPEP § 2143.03; *In re Fine*, 837 F.2d 1071 (Fed. Cir. 1988). As discussed above, claims 1, 9 and 19 are in condition for allowance. Applicants submit that claims 6, 13 and 23 are therefore allowable by virtue of their dependence on allowable independent claims, as well as by virtue of the features recited therein. Applicants respectfully request withdrawal of the rejections and allowance of these claims.

Conclusion

Given the above amendments and accompanying remarks, all claims pending in the application are in condition for allowance. If the undersigned attorney has overlooked a teaching in any of the cited references that is relevant to allowance of the claims, the Examiner is requested to specifically point out where such teaching may be found. Further, if there are any informalities or questions that can be addressed via telephone, the Examiner is encouraged to contact the undersigned attorney at (206) 292-8600.


Charge Deposit Account

Please charge our Deposit Account No. 02-2666 for any additional fee(s) that may be due in this matter, and please credit the same deposit account for any overpayment.

Respectfully submitted,

BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP

Date: 9-13-05


Todd M. Becker
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Registration No. 43,487

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